



United States Department of Agriculture - Agricultural Research Service

Food Safety Research Information Office

FSRIO

FOOD SAFETY RESEARCH: A FOCUS ON

Agricultural Biotechnology

Agricultural biotechnology is a science that includes both traditional plant breeding and genetic engineering techniques to develop, modify, or improve living organisms such as plants, animals and microorganisms. It represents a technology gradient ranging from traditional biotechniques such as artificial insemination and embryo transfer to modern innovations which involve genetic engineering, monoclonal antibody production for diagnostics, tissue-culture methods leading to transgenics, and DNA markers to assess variation.

Modern agricultural biotechnology allows a specific gene(s) to be moved from one organism into another unrelated species to confer a desired trait.

Genetically modified (GM) food crops and agricultural biotechnology have generated interest and controversy around the world. Understanding both the benefits and the potential negative effects to the food supply and the environment are the focus of many scientific bodies. GM crops are planted on more than 109 million acres worldwide. The United States accounts for more than two-thirds of all biotech crops planted globally. GM food crops grown by U.S. farmers include corn, cotton, soybeans, canola, squash, and papaya.



Traditional plant breeding: A breeder collects pollen.

According to the Society of Toxicology, no evidence of potential adverse health effects arising from biotechnology-derived foods have been reported.

Scientific evidence indicates that any possible adverse health effects from GM food are not different in nature from food created through conventional breeding. Some concerns of GM food are:

- 1) Toxicity of the Transgene; 2) Production of Toxins; and 3) Production of Allergens.



Transgenic Cotton: A transgenic crop plant contains a gene(s) that has been artificially inserted. The inserted gene sequence is called a transgene.

RESEARCH AREAS

- Develop new technologies to improve the control of expression of specific transgenes and their localization in the host genome.
- Identify factors that confer tolerance to drought, flooding, heat, freezing in order to transfer these traits to present crops.
- Identify and characterize plant genes for disease resistance.
- Enhance disease resistance in plants by incorporating the gene through conventional and genetic engineering techniques.
- Conduct risk assessment studies in domesticated animals; microorganisms; plants; and fish.

GENERAL FACTS

- Many food products contain genetically engineered ingredients due to four biotech crops: soybeans, corn, canola and cotton. These biotech crops were engineered for insect control and weed management.
- Soybean - More than 70 percent of the U.S. soybean crop is a biotech variety making genetically engineered herbicide-tolerant soybeans the most common biotech plant products on the market. Soybean-based ingredients are soybean oil, soy lecithin, and soy protein.
- Corn - In 2002, over 25 percent of the U.S. field corn crop grown was a biotech variety. Corn-based ingredients include corn flour, corn oil, and corn syrup. Genetically modified sweet corn is less prevalent and almost no canned or frozen corn is from biotech corn plants.
- Canola - The U.S. imports most of its canola from Canada. In 2002, 50 percent of the rapeseed crop (canola oil is extracted from the rapeseed plant) was genetically engineered. Products containing canola include: canola oil, salad dressings, margarines, processed cheese, "non-dairy" products, chips, cookies, pastries, chocolates, candy coatings, and confections.
- Cotton - Nearly 70 percent of the cotton crop is genetically engineered. Products containing cotton seed oil include: peanut butter, cooking oils, chips, crackers and cookies.

ONLINE RESOURCES

Pew Initiative on Food and Biotechnology -- University of Richmond

<http://pewagbiotech.org/>

The International Center for Genetic Engineering and Biotechnology

<http://www.icgeb.trieste.it/>

Agricultural Biotechnology Support Project -- Michigan State University Institute of International Agriculture

<http://www.iiia.msu.edu/absp/>

Transgenic Crops: An Introduction and Resource Guide -- Colorado State University

<http://www.colostate.edu/programs/lifesciences/TransgenicCrops/>

Genetically Engineered Organisms -- Cornell University Cooperative Extension

<http://www.geo-pie.cornell.edu/>

Biotechnology in Food and Agriculture -- FAO

<http://www.fao.org/biotech/>

The Safety of Biotechnology-Derived Food Crops -- CFIA

<http://www.inspection.gc.ca/english/sci/biotech/safsal/safsale.shtml>

Biotechnology -- FDA/CFSAN

<http://vm.cfsan.fda.gov/~lrd/biotechm.html>

Bioengineered Foods -- FDA

<http://www.fda.gov/oc/biotech/default.htm>

USDA Animal and Plant Health Inspection Service Plant Quarantine

<http://www.aphis.usda.gov/ppq/biotech/>

The Safety of Genetically Modified Foods Produced Through Biotechnology -- Society of Toxicology, September 2002

http://www.toxicology.org/Information/GovernmentMedia/GM_Food.html

Agricultural Biotechnology -- Cornell University, New York State Agricultural Experiment Station

<http://www.nysaes.cornell.edu/comm/gmo/>



The National Agricultural Library (NAL), the largest agricultural library in the world, has been serving agriculture since 1862. NAL was established by Congress as the primary agricultural information resource of the United

States of America. Its mission, stated simply, is "to ensure and enhance access to agricultural information for a better quality of life." The Library's work in collecting, preserving and making agricultural information available is fundamental to the continued well-being and growth of U.S. agriculture, and the development of food supplies for the nation and the world. NAL provides world leadership in developing and applying information technologies, ensuring that agricultural information is available to those who need it, whenever the need it and wherever they are. Visit the NAL web site at <http://www.nal.usda.gov>.

The Food Safety Research Information Office (FSRIO) publicly launched its web site, www.nal.usda.gov/fsrio, on July 2, 2001, in support of the National Food Safety Initiative.

A key component of the web site is a database of food safety research projects. The database is a resource for researchers and administrators to assess food safety research needs and priorities, thereby minimizing duplication of effort. FSRIO was established in accordance with H.R. 2534 Agricultural Research, Extension and Education Reauthorization Act of 1997, SEC. 503.

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